

BEST AVAILABLE COPY PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing (day/month/year) 01 February 2001 (01.02.01)	
International application No. PCT/IT99/00173	Applicant's or agent's file reference 7141/610
International filing date (day/month/year) 16 June 1999 (16.06.99)	Priority date (day/month/year)
Applicant TERUGGI, Piergiorgio et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
29 December 2000 (29.12.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Olivia TEFY Telephone No.: (41-22) 338.83.38
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PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

RECORD COPY

For receiving Office use only	
PCT/IT99 / 00173	
International Application No.	
16 JUN 1999 (16 / 06 / 99)	
International Filing Date	
MINISTERO INDUSTRIA, COMMERCIO e ARTIGIANATO Direzione Generale per lo sviluppo produttivo e la competitività - Ufficio italiano brevetti e marchi -	
Name of the Receiving Office: MINISTERO EUROPEO RST VIA MOLISE, 12 - 00107 ROMA	
Applicant's or agent's file reference (if desired) (12 characters maximum)	7141/610

Box No. I TITLE OF INVENTION "PLANT FOR WASHING PLASTIC MATERIAL"	
Box No. II APPLICANT	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
AMUT S.p.A. Via Cameri, 16 I-28100 NOVARA Italy	
<input type="checkbox"/> This person is also inventor.	
Telephone No. 0039-0321-6641	
Facsimile No. 0039-0321-474200	
Teleprinter No.	
State (that is, country) of nationality: IT	State (that is, country) of residence: IT
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input checked="" type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
TERUGGI, Piergiorgio Via Garibaldi, 29 I-28010 FONTANETO D'ARGOGNA (NO) Italy	
This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
State (that is, country) of nationality: IT	State (that is, country) of residence: IT
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
VALENTINI, Giuliano MARIETTI E GISLON S.r.l. Via Larga, 16 I-20122 MILANO Italy	
Telephone No. 0039-02-86464387	
Facsimile No. 0039-02-86463303	
Teleprinter No.	
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

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Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

SERENI, Enrico
Via Emilia S. Pietro, 18
I-42100 REGGIO EMILIA
Italy

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality: IT

State (that is, country) of residence: IT

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

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Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

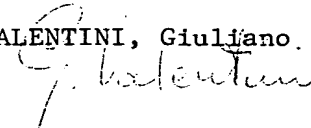
- | | |
|--|--|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |
| <input checked="" type="checkbox"/> LC Saint Lucia | <input checked="" type="checkbox"/> AE United Arab Emirates |
| <input checked="" type="checkbox"/> LK Sri Lanka | <input checked="" type="checkbox"/> ZA South Africa |
| <input checked="" type="checkbox"/> LR Liberia | <input type="checkbox"/> |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☒ AE United Arab Emirates
- ☒ ZA South Africa
- ☐

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

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Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				
<input type="checkbox"/> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): _____				
<small>* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.</small>				
Box No. VII INTERNATIONAL SEARCHING AUTHORITY				
Choice of International Searching Authority (ISA) <small>(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):</small>		Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):		
ISA /		Date (day/month/year)	Number	Country (or regional Office)
Box No. VIII CHECK LIST; LANGUAGE OF FILING				
This international application contains the following number of sheets: request : 4 description (excluding sequence listing part) : 12 claims : 5 abstract : 1 drawings : 1 sequence listing part of description : _____ Total number of sheets : 23		This international application is accompanied by the item(s) marked below: 1. <input checked="" type="checkbox"/> fee calculation sheet 2. <input checked="" type="checkbox"/> separate signed power of attorney 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input type="checkbox"/> translation of international application into (language): (WILL FOLLOW) 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input type="checkbox"/> other (specify):		
Figure of the drawings which should accompany the abstract: 1		Language of filing of the international application: ITALIAN		
Box No. IX SIGNATURE OF APPLICANT OR AGENT				
<small>Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).</small>				
VALENTINI, Giuliano. 				

For receiving Office use only		2. Drawings: <input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:	16 JUN 1999 (16 / 06 / 99)	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA /	6. <input checked="" type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

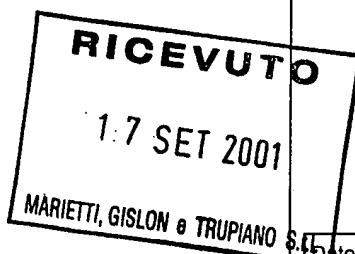
For International Bureau use only	
Date of receipt of the record copy by the International Bureau:	12 JULY 1999 (12. 07. 99)

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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

VALENTINI, Giuliano
MARIETTI E GISLON S.R.L.
Via Larga, 16
20122 Milano
ITALIE



PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year)

13.09.2001

Applicant's or agent's file reference
7141/610

IMPORTANT NOTIFICATION

International application No.
PCT/IT99/00173

International filing date (day/month/year)
16/06/1999

Priority date (day/month/year)
16/06/1999

Applicant

AMUT S.P.A. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Langhoff, M

Tel. +49 89 2399-8221





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PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 7141/610	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IT99/00173	International filing date (<i>day/month/year</i>) 16/06/1999	Priority date (<i>day/month/year</i>) 16/06/1999
International Patent Classification (IPC) or national classification and IPC B08B3/04		
Applicant AMUT S.P.A. et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 4 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input checked="" type="checkbox"/> Certain defects in the international application</p> <p>VIII <input checked="" type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 29/12/2000	Date of completion of this report 13.09.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Kofoed, J Telephone No. +49 89 2399 2981 	

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IT99/00173

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-10 as originally filed

Claims, No.:

1-22 as received on 15/05/2001 with letter of 10/05/2001

Drawings, sheets:

1/1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/IT99/00173

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-22
	No: Claims
Inventive step (IS)	Yes: Claims 1-22
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-22
	No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

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Section V:

- 1). Reference is made to the following documents:

D1: US4073661A [Y]

D2: EP0056437A [Y];

- 2). The present application does meet the requirements of Article 33(2-3) PCT, because the subject-matter of claim 1 is new and involves an inventive step.
- 2.1. Document D1, which is considered to represent the most relevant state of the art, clearly discloses (cf. the parts mentioned in the search report) an apparatus as defined in the preamble of claim 1.
- 2.2. It can be concluded that the features of claim 1 not disclosed in D1 are the means for continuously varying the time said scales remain in said washing apparatus as a function of the quantity of scales contained at the same moment in said apparatus.
- 2.3. The problem to be solved by the present invention may therefore be regarded as providing means enabling efficient and cost effective control of the washing operation carried out in the apparatus, such that only the necessary washing action is carried out.
- 2.4. The solution proposed in claim 1 of the present application, i.e. the means for continuously varying the time said scales remain in said washing apparatus as a function of the quantity of scales contained at the same moment in said apparatus, can be considered as involving an inventive step (Article 33(3) PCT), for the following reasons.

Document D2 in fact relates to a washing apparatus too, however, D2 clearly relates to batch treatment primarily. Only under these circumstances, it is suggested to vary the washing time in accordance with the amount of material to be washed in the apparatus, see the second paragraph on page 1.

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The skilled person working with the rather large scale continuous working equipment of D1 would not see the possible use of the batch operating D2 concept in the continuous washing apparatus of D1.

- 2.5. Also the remaining documents on file do not hint the presently claimed solution concept of continuously varying the time said scales remain in said washing apparatus as a function of the quantity of scales contained at the same moment in said apparatus,
- 3). The present application do meet the requirements of Article 33(2-3) PCT, because the subject-matter of claim 14 is new and involves an inventive step.
- 3.1. Document D1, which is considered to represent the most relevant state of the art, clearly discloses (cf. the parts mentioned in the search report) a washing method as defined in the preamble of claim 14.
- 3.2. It can be concluded that the features of claim 14 not explicitly disclosed in D1 is the step of continuously varying the time said scales remain in said washing apparatus as a function of the quantity of scales contained at the same moment in said apparatus.
- 3.3. The problem to be solved by the present invention may therefore again be regarded as providing means enabling efficient and cost effective control of the washing operation known from D1 so that only the necessary washing action is carried out.
- 3.4. The solution proposed in claim 14 of the present application, i.e. the step of continuously varying the time said scales remain in said washing apparatus as a function of the quantity of scales contained at the same moment in said apparatus, is to be considered as involving an inventive step (Article 33(3) PCT), for the following reasons.
- Document D2 in deed also relates to a washing apparatus, however, D2 clearly relates to batch treatment. Only under these circumstances, it is suggested to vary the washing time in accordance with the amount of material to be washed in the apparatus, see the second paragraph on page 1.

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The skilled person working with the rather large scale continuous working equipment of D1 would not see the possible use of the batch operating D2 concept in the continuous washing method of D1.

- 3.5. Also the remaining documents on file do not hint the presently claimed solution concept of continuously varying the time said scales remain in said washing apparatus as a function of the quantity of scales contained at the same moment in the apparatus used for the method.
- 4). The dependent claims 2-13 and 15-22 relate to details within the scope of claims 1 and 14 and they likewise meet the requirements of the PCT.

Sections VIII and VII:

- 1). Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description.
- 2). The description, i.e. pages 3 and 5, is not fully in conformity with the presently valid claims.

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REPLACED BY
ART 34 AMDT

CLAIMS

1. Plant for the continuous washing of plastic material in scales, of the type comprising a washing apparatus equipped with at least one rotating stirrer and containing a washing fluid, at least one
5 filtering unit connected to said apparatus for purifying said washing fluid, a device for feeding said scales to said washing apparatus, a device for withdrawing said scales from said washing apparatus and a plurality of conduits to connect in fluid communication said washing apparatus and said filtering unit with a circuit in which said
10 washing fluid flows, characterised by comprising means for varying the time said scales remain in said washing apparatus as a function of the quantity of scales contained at the same moment in said apparatus.
2. A plant according to Claim 1, characterised in that said
15 rotating stirrer, said device for feeding said scales and said device for withdrawing said scales are operated by respective electric motors.
3. A plant according to Claim 1 or 2, characterised in that said means for varying the time said scales remain in said washing
20 apparatus comprises at least one first control device acting to receive as input a data item representative of the current drawn by the motor driving said stirrer and to control the driving of said motors connected respectively to said device for feeding said scales and to said device for withdrawing said scales.
- 25 4. A plant according to Claim 1, characterised by comprising at least one second control unit for varying the speed of rotation of said stirrer as a function of the quantity of scales contained in said washing apparatus.

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5. A plant according to any of the preceding Claims, characterised in that said washing apparatus comprises a closed container and is surrounded by a heat-insulating covering shell to form a gap between the inside wall of said shell and the external wall of said container.
6. A plant according to Claim 5, characterised by comprising means for making a heating fluid to circulate in said gap.
7. A plant according to any of the preceding Claims, characterised in that said washing fluid consists of an aqueous solution.
8. A plant according to any of the preceding Claims, characterised by comprising a conduit of readmission that carries at least one fraction of the washing fluid purified by said at least one filtering unit to said device for withdrawing said scales from said washing apparatus, the remaining fraction of said fluid being reintroduced directly into said washing apparatus.
9. A plant according to Claim 8, characterised by comprising at least one heat exchanger device located along said conduit of readmission to control the temperature of said washing fluid by means of a heating fluid.
10. A plant according to Claim 8, characterised by comprising at least one device located along said conduit of readmission for monitoring the pH of said washing fluid.
11. A plant according to Claim 8, characterised by comprising at least one station located along said conduit of readmission for adding one or more chemical products to the aqueous solution that constitutes said washing fluid.

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12. A plant according to Claim 6 or 9, characterised in that said heating fluid introduced into said gap and in said heat exchanger device consists of high temperature steam.
13. A plant according to any of the preceding Claims,
5 characterised in that said at least one filtering unit comprises at least one fine-pore filtering element.
14. Method for washing plastic material in scales, of the type providing the feeding and the withdrawing of said scales in a continuous way to a washing apparatus equipped with at least one
10 rotating stirrer and containing a washing fluid, characterised by providing the regulation of the time said scales remain in said apparatus as a function of the quantity of scales contained at that same moment in said apparatus.
15. A method according to Claim 14, characterised in that the
15 time said scales remain in said apparatus is regulated by acting on the quantity of scales fed to said washing apparatus and on the quantity of scales withdrawn from said washing apparatus.
16. A method according to Claim 14, characterised by further providing the regulation of the speed of rotation of said stirrer as a
20 function of the quantity of scales contained at that same moment in said apparatus.
17. A method according to Claim 14, characterised in that said washing apparatus comprises a substantially closed container in which said washing fluid and said scales are maintained at a
25 substantially constant temperature by means of a heating fluid that circulates in contact with the external surface of said container.



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18. A method according to Claim 14, characterised by providing for the purification of said washing fluid by means of a filtering unit comprising at least one fine-pore filtering element.
19. A method according to Claim 14, characterised by providing
5 for the control of the temperature of said washing fluid leaving said filtering unit before its readmission into said washing apparatus.
20. A method according to Claim 14, characterised by providing for the control of the pH of said washing fluid and the addition of chemical mixtures to said washing fluid leaving said filtering unit
10 before its readmission into said washing apparatus.
21. A method according to Claim 14, characterised in that at least one fraction of said washing fluid is readmitted in counter-current with respect to the flow of said scales in a device for withdrawing said scales from said apparatus.
- 15 22. A method according to Claim 14, characterised by maintaining a quantity of said washing fluid in said apparatus that is proportional to the quantity of scales present at that same moment in said washing apparatus.

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 7141/610	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/IT 99/00173	International filing date (day/month/year) 16/06/1999	(Earliest) Priority Date (day/month/year)
Applicant AMUT S.P.A. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1
☐ None of the figures.

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International Application No
PCT/IT 99/00173

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B08B3/04 B08B3/08 B08B3/10 D06F37/30 D06F39/00
B29B17/02 B03B5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B08B D06F B29B B03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 073 661 A (BUZGA HEINRICH ET AL) 14 February 1978 (1978-02-14) column 5, line 29-62; figures 1-3 ---	1-22
Y	EP 0 056 437 A (SIEMENS AG) 28 July 1982 (1982-07-28) page 1, paragraph 2 ---	1-22
A	PATENT ABSTRACTS OF JAPAN vol. 006, no. 267 (M-182), 25 December 1982 (1982-12-25) & JP 57 159612 A (YOSHINO KOGYOSH0:KK), 1 October 1982 (1982-10-01) abstract --- -/--	1-22

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"Z" document member of the same patent family

Date of the actual completion of the international search

2 February 2000

Date of mailing of the international search report

14/02/2000

Name and mailing address of the ISA

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Kofoed, J

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 99/00173

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 185 041 A (ANDERSON ROBERT M ET AL) 9 February 1993 (1993-02-09) column 2, line 63-68; figures 1,6 column 3, line 46-68	1-22
A	WO 92 08591 A (PREVIERO SAS) 29 May 1992 (1992-05-29) figures 1,6	1-22

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INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/IT 99/00173

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4073661	A	14-02-1978	DE 2525749 A	16-12-1976
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			JP 6502134 T	10-03-1994
			US 5390799 A	21-02-1995

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I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC Int.C1. 5 B29B17/02						
II. FIELDS SEARCHED <div style="text-align: center; border: 1px solid black; padding: 2px;">Minimum Documentation Searched⁷</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Classification System</td> <td style="padding: 5px;">Classification Symbols</td> </tr> <tr> <td style="padding: 5px;">Int.C1. 5</td> <td style="padding: 5px;">B29B ; B03B ; B02C</td> </tr> </table> <div style="text-align: center; border: 1px solid black; padding: 2px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched⁸</div>			Classification System	Classification Symbols	Int.C1. 5	B29B ; B03B ; B02C
Classification System	Classification Symbols					
Int.C1. 5	B29B ; B03B ; B02C					
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹						
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³				
X	AT,B,389 488 (MASCHINENFABRIK ANDRITZ A.G.) 11 December 1989 see the whole document ----	1,2				
A	PATENT ABSTRACTS OF JAPAN vol. 6, no. 267 (M-182)(1145) 25 December 1982 & JP,A,57 159 612 (YOSHINO KOGYOSHO K.K.) 1 October 1982 see abstract ----	1,3,6,8				
A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 311 (M-734)(3158) 24 August 1988 & JP,A,63 084 905 (YOSHINO KOGYOSHO CO LTD) 15 April 1988 see abstract ----	1				
A	US,A,4 617 111 (GRIMM ET AL.) 14 October 1986 see abstract; claims ----- -/-	7				
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁰ Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p> </div> </div>						
IV. CERTIFICATION						
Date of the Actual Completion of the International Search <div style="text-align: center; font-size: 1.2em;">03 FEBRUARY 1992</div>	Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.2em;">11.02.92</div>					
International Searching Authority <div style="text-align: center;">EUROPEAN PATENT OFFICE</div>	Signature of Authorized Officer <div style="text-align: center;">LASSON C.Y.M. </div>					

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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Cited Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	<p>PATENT ABSTRACTS OF JAPAN vol. 6, no. 97 (M-134)(975) 5 June 1982 & JP,A,57 031 529 (TOYO BOSEKI K.K.) 20 February 1982 see abstract</p> <p style="text-align: center;">---</p>	1

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

EP
SA

9102135
52790

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
AT-B-389488	11-12-89	None	
US-A-4617111	14-10-86	None	

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(10) International Publication Number
WO 00/76681 A1

- *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

[illegible]

(57) Abstract: A plant for the continuous washing of plastic material in scales, comprising a washing apparatus, at least one filtering unit connected to the apparatus for purifying the washing fluid and means for varying the time the scales remain in the washing apparatus as a function of the quantity of scales contained at that same moment in the same apparatus.

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"PLANT FOR WASHING PLASTIC MATERIAL "

Field of the Invention

The present invention relates to a plant for washing plastic material in scales, in particular a plant of the type destined to be inserted in
5 a line for the treatment of recyclable plastic materials.

State of the Art

The products in plastic material containing one or more recyclable parts are conveyed to the recycling plants and subjected to different treatments to separate the recyclable parts and make
10 them fit for subsequent reuse.

A particular example of recyclable plastic material is the polyethylene terephthalate (PET) of which the bottles containing mineral waters, drinks or similar are generally made.

In order to effectively obtain recyclable PET from these bottles, all
15 those parts joined to the bottle but made with other materials, for instance the labels in paper or plastic, the glue used to stick them to the bottle, as well as the stopper and the base of the bottle, generally made of polyolefin or similar, must be eliminated.

The processes till now proposed in the known technique, comprising
20 different phases of washing and separation of the materials, haven't given satisfactory results till now because both the purity of the recyclable material so obtained and the costs necessary to get a product of high purity. These drawbacks are mainly due to the need to reconcile two clearly conflicting demands.

25 On one hand, the washing treatment must be sufficiently energetic and extended in time to allow the separation of the glue fixing the labels. Furthermore, the continuous removal of the glue and the residues of labels from the washing fluid must be guaranteed.

On the other, the costs necessary to satisfy these requirements are particularly high, because of the considerable quantity of washing fluid necessary to remove the glue, and because of the long time required by the treatment. Furthermore, it must be remembered that
5 it is necessary bring the glue to the melting temperature, to allow the same to melt and to mix with the washing fluid. That requires a high waste of energy, and therefore causes very high costs, if it is desired to obtain recyclable PET of high purity.

Purposes of the invention

10 The purpose of the present invention is therefore to propose a plant for washing recyclable plastic material in a continuous way that allows the washing of the plastic material, preferably reduced to scales, to be effected in a particular efficient way.

Another purpose of the present invention is to propose a plant of the
15 type specified above, that allows the washing of recyclable plastic material to be effected with particular limited costs.

A further purpose of the present invention is to propose a method for washing the recyclable plastic material in a continuous way that allows recyclable plastic material of high purity to be obtained.

20 Summary of the invention

These purposes are achieved by the present invention, which relates to a plant for the continuous washing of plastic material in scales, of the type comprising a washing apparatus equipped with at least one rotating stirrer and containing a washing fluid, at least
25 one filtering unit connected to the apparatus for purifying the washing fluid, a device for feeding the scales to the washing apparatus, a device for withdrawing the scales from the washing apparatus and a plurality of conduits for connecting the washing

apparatus and the filtering unit in fluid communication with a circuit in which the washing fluid flows, characterised by comprising means for varying the time in which the scales remain in the washing apparatus as a function of the quantity of scales contained
5 at that same moment in the apparatus.

In this way it is possible to hold the scales in the washing apparatus only for the time necessary to remove all the glue from the scales, thus allowing a considerable limitation of the washing fluid employed during the treatment. The washing fluid is constituted for
10 instance by an aqueous solution maintained at a sufficiently high temperature to melt the glue present on the scales.

The means for varying the time in which the scales remain in the washing apparatus comprise at least a first control device that receives in input a data item representative of the current drawn by
15 the motor driving the stirrer and controls the operation of the motors connected to the device for feeding the scales and the device for withdrawing the scales respectively. The devices for feeding and withdrawing the scales could be constituted for instance by tilted screw conveyors operated by respective electric motors.

20 A second control device allows the speed of rotation of the stirrer to be varied as a function of the quantity of scales present at that same moment in the apparatus. That allows advantageously to adapt the frictional action between the scales imparted by the stirrer as a function of their quantity present at a certain instant in the
25 apparatus.

According to a preferential embodiment of the present invention, the washing apparatus is constituted by a closed container that is

surrounded by a heat-insulating shell to form a gap between the inside wall of the shell and the external wall of the container.

A heating fluid, for instance high temperature steam, is advantageously introduced into the gap to maintain the inside the
5 apparatus at a constant temperature sufficient to cause the melting of the glue on the scales subjected to treatment and prevent the same glue from solidifying and being deposited again on the scales.

The washing fluid withdrawn from the apparatus is conducted to a
10 filtering unit in which is separated, not only the papery residues still present, but also the glue which is deposited on a fine-pore filtering element. The latter is preferably constituted by a fossil meal filter from which the layer of glue that sticks there is continually removed.

The washing fluid as purified is reintroduced by means of a conduit
15 of readmission which carries at least a fraction of the purified washing fluid to the device for withdrawing the scales from the washing apparatus. The purified fluid coming out from the filtering unit, which is undoubtedly cleaner than the washing fluid dragged together with the scales leaving the washing apparatus, is
20 advantageously used to rinse the scales before these go on to a subsequent stage. That makes it possible therefore to bring impurities still present on the scales back into the apparatus again. This not only reduces the quantity of washing fluid employed, but also improves the purity of the material leaving the apparatus.

25 There is preferably a heat-exchanger provided along the readmission conduit that permits the fluid to be brought up to the desired temperature again before the reintroduction in the washing apparatus, as well as one or more stations to monitor and, if

necessary, correct the pH and the composition of the reintroduced fluid.

The invention further concerns a method for washing plastic material in scales, of the type providing the feeding and the withdrawing in a continuous way of scales in a washing apparatus
5 equipped with at least one rotating stirrer and containing a washing fluid, characterised by providing for the regulation of the time the scales remain in the apparatus as a function of the quantity of scales contained at that same moment in the same apparatus.

10 A particularly advantageous aspect of the method according to the invention consists in maintaining a quantity of washing fluid in the washing apparatus that is proportional to the quantity of scales present at that same moment in the apparatus. This allows that only a quantity of fluid effectively necessary to each instant of the
15 washing phase be used, thus allowing to further limit the consumption of the washing fluid employed.

Furthermore, the method according to the invention, provides the regulation of the speed of rotation of the stirrer as a function of the quantity of scales contained at that same moment in said
20 apparatus, thus allowing the frictional action between the scales to be varied as a function of the actual quantity of scales subjected to washing in any determined instant.

Brief Description of the Drawings

Further advantages and characteristics of the present invention will
25 be more evident from the description that follows, made by way of example and with not limiting purpose, with particular reference to the attached drawing, in which a schematic view of a plant according to the present invention is illustrated.

Modes for Carrying Out the Invention

The figure represents a plant for the continuous washing of plastic material in scales and, in particular, of scales made of recyclable PET. The plant in particular comprises a washing apparatus 1
5 equipped with an stirrer 2 set in rotation by an electric motor 3, with a plurality of vanes 4 that impart an action of agitation to both a washing fluid, consisting preferably of an aqueous solution, and the scales of plastic material present in the apparatus 1.

The plastic material in scales arrives at the apparatus 1, represented
10 symbolically by the P_{IN} arrow, and is introduced into the washing apparatus 1 by means of a tilted screw conveyor 5 driven by an electric motor 6. The scales introduced into the apparatus 1 generally transport also a small fraction of a fluid, also consisting of an aqueous solution used in upstream processing stages, for
15 instance a floatation bath to separate PET (heavier than water) from polyolefin or similar (lighter than water).

Inside the washing apparatus 1 the scales are subjected to the action of agitation imparted by the stirrer 2 in the presence of the washing fluid maintained at a constant temperature preset in the
20 interval between 85 °C and 100 °C, preferably around 95 °C. The stirrer energetic action causes mutual friction between the scales and the simultaneous action of the washing fluid at preset temperature causes the glue to separate from the scales and become suspended in the washing fluid.

25 To prevent the glue solidifying again and being re-deposited on the same scales, it is particularly important to maintain a constant temperature inside the apparatus. For this reason, the washing apparatus 1 is made of a closed container 10 completely

surrounded by a covering of heat-insulating shell 11. Between the external wall of the container 10 and the inside wall of the shell 11 there is a gap 12 in which high-temperature steam is caused to circulate in order to maintain substantially constant the temperature inside the washing apparatus 1.

The flow of scales inside the washing apparatus 1, and therefore the time they remain in the apparatus, is controlled on the basis of the quantity of scales present at that same moment in the washing apparatus. That is done by measuring the instantaneous current drawn by the motor 3 driving the stirrer 2. The signal representative of this parameter is sent to a control unit 20 that consequently controls the motor 6 of the screw conveyor 5 introducing the scales and the motor 36 of the screw conveyor 35 withdrawing the scales. Inverter devices are connected to both the electric motors 6 and 36 respectively which allow the speed of the screw conveyors to be regulated.

A further control is effected on the rotation speed of the motor 3, and therefore on the stirring action inside the washing apparatus 1, always as a function of the quantity of scales present at that same moment in the apparatus 1. This control could be effected by the same unit 20, as represented in the figure or, if necessary, by a separate control unit that acts on an inverter device connected to the electric motor 3.

These controls allow the parameters that determine effective washing of the scales, i.e. the stay time and the amount of agitation, to be adapted advantageously on the basis of the quantity of scales present in the apparatus in any determined instant. With continuous washing, the quality of the product output

by the plant according to the present invention can be maintained constant.

It is important to point out that the quantity of washing fluid present in the washing apparatus 1 during normal operation is always
5 maintained substantially proportional to the quantity of scales present at that same moment in the apparatus. That is achieved by regulating the quantity of washing fluid that is readmitted to the apparatus as a function of the quantity of fluid expelled from the filtering unit 50 that is described below in more detail.

10 The scales leaving the apparatus (indicated schematically by the Pour arrow) are withdrawn by the screw conveyor 35 at the extremity opposite that of introduction and are sent to the next processing stage, for instance a scale rinsing and/or drying and/or desiccation stage. There is a perforated grate 15 provided in
15 correspondence with the collecting extremity that allows the collection of the washing fluid to be purified and sends it to a particular filtering unit 50 that allows the removal of the glue from the washing fluid.

The washing fluid removed from the apparatus 1 is sent by means of
20 a conduit 16 to a heat exchanger 17 that provides for the lowering of the temperature of the fluid by means of circulation of cooling water. A pump 18 located along a conduit 19 allows to transfer the washing fluid from the heat exchanger 17 to the filtering unit 50. The latter comprises a filtering element 51, of the fine-pore type, partially
25 immersed in a bath 52. The filtering element 51 comprises preferably a drum made of fossil meal on which is continually deposited, and from which is continually removed, the glue mixed with the washing fluid.

Since the temperature of the fluid in the filtering unit 50 is lower than the melting point of the glue, the latter is deposited on the external surface of the filtering element 51 and is continually removed, if necessary together with a thin layer of the filtering element 51, by a
5 blade 53 and expelled through a waste S2.

The washing fluid thus purified is regenerated in its essential characteristics before being reintroduced into the washing apparatus 1. In particular, the fluid is withdrawn from the filtering unit 50 by means of a pump 60 and sent toward a reservoir 70, in which
10 a heat exchanger 80 raises the temperature by means of steam (V_{IN} arrows and V_{OUT}). Fresh water (arrow H_2O) is introduced into the reservoir 70 to compensate the loss of fluid in the filtering unit 50 and to make up the circulating volume.

The fluid driven by a pump 90 is restored in a control station 100 by a
15 possible correction of the pH by means of admission of suitable additives (PH arrow), as well as in a control station 110 in correspondence of which suitable chemical additives (T arrow) such as surfactants or similar substances, for instance, are added.

A conduit 91 then carries the fluid toward a junction 92 from which
20 one conduit 93 brings the purified fluid again directly into the washing apparatus 1. A part of the purified fluid is advantageously conveyed in another conduit 94, also connected to the junction 92, and introduced in the screw conveyor 35 to carry out an effective rinsing of the scales in counter-current. Both the conduits 93 and 94
25 are preferably equipped with respective valves 95 and 96 to allow the independent regulation of the fractions of liquid reintroduced into the apparatus 1 and in the screw conveyor 35.

- Preferably, the quantity of washing fluid of introduced initially into the apparatus is proportional to what is presumed to be the ideal quantity for effective washing. It has been established that, during the normal operation, the quantity of washing fluid present at that
- 5 same moment in the apparatus 1 tends, however, to stay substantially proportional to the quantity of scales present inside the washing apparatus 1 in the same instant. This is due to the fact that the scales, as much in entry as in exit, carry in each case some fluid adhering to them.
- 10 Therefore, the only regulation necessary to maintain the desired optimal proportion between quantity of scales and quantity of the washing fluid is effected by acting simply on the pump 90 and on the admission of fresh water in correspondence of the reservoir 70. That not only allows limiting the quantity of fluid used by the plant,
- 15 but also means always having optimum conditions inside the apparatus 1 to get effective continuous washing treatment, independently of the variation of flow of scales upstream and/or downstream of the plant according to the present invention.

CLAIMS

1. Plant for the continuous washing of plastic material in scales, of the type comprising a washing apparatus equipped with at least one rotating stirrer and containing a washing fluid, at least one
5 filtering unit connected to said apparatus for purifying said washing fluid, a device for feeding said scales to said washing apparatus, a device for withdrawing said scales from said washing apparatus and a plurality of conduits to connect in fluid communication said washing apparatus and said filtering unit with a circuit in which said
10 washing fluid flows, characterised by comprising means for varying the time said scales remain in said washing apparatus as a function of the quantity of scales contained at the same moment in said apparatus.
2. A plant according to Claim 1, characterised in that said
15 rotating stirrer, said device for feeding said scales and said device for withdrawing said scales are operated by respective electric motors.
3. A plant according to Claim 1 or 2, characterised in that said means for varying the time said scales remain in said washing
20 apparatus comprises at least one first control device acting to receive as input a data item representative of the current drawn by the motor driving said stirrer and to control the driving of said motors connected respectively to said device for feeding said scales and to said device for withdrawing said scales.
- 25 4. A plant according to Claim 1, characterised by comprising at least one second control unit for varying the speed of rotation of said stirrer as a function of the quantity of scales contained in said washing apparatus.

5. A plant according to any of the preceding Claims, characterised in that said washing apparatus comprises a closed container and is surrounded by a heat-insulating covering shell to form a gap between the inside wall of said shell and the external wall of said container.
6. A plant according to Claim 5, characterised by comprising means for making a heating fluid to circulate in said gap.
7. A plant according to any of the preceding Claims, characterised in that said washing fluid consists of an aqueous solution.
8. A plant according to any of the preceding Claims, characterised by comprising a conduit of readmission that carries at least one fraction of the washing fluid purified by said at least one filtering unit to said device for withdrawing said scales from said washing apparatus, the remaining fraction of said fluid being reintroduced directly into said washing apparatus.
9. A plant according to Claim 8, characterised by comprising at least one heat exchanger device located along said conduit of readmission to control the temperature of said washing fluid by means of a heating fluid.
10. A plant according to Claim 8, characterised by comprising at least one device located along said conduit of readmission for monitoring the pH of said washing fluid.
11. A plant according to Claim 8, characterised by comprising at least one station located along said conduit of readmission for adding one or more chemical products to the aqueous solution that constitutes said washing fluid.

12. A plant according to Claim 6 or 9, characterised in that said heating fluid introduced into said gap and in said heat exchanger device consists of high temperature steam.

13. A plant according to any of the preceding Claims,
5 characterised in that said at least one filtering unit comprises at least one fine-pore filtering element.

14. Method for washing plastic material in scales, of the type providing the feeding and the withdrawing of said scales in a continuous way to a washing apparatus equipped with at least one
10 rotating stirrer and containing a washing fluid, characterised by providing the regulation of the time said scales remain in said apparatus as a function of the quantity of scales contained at that same moment in said apparatus.

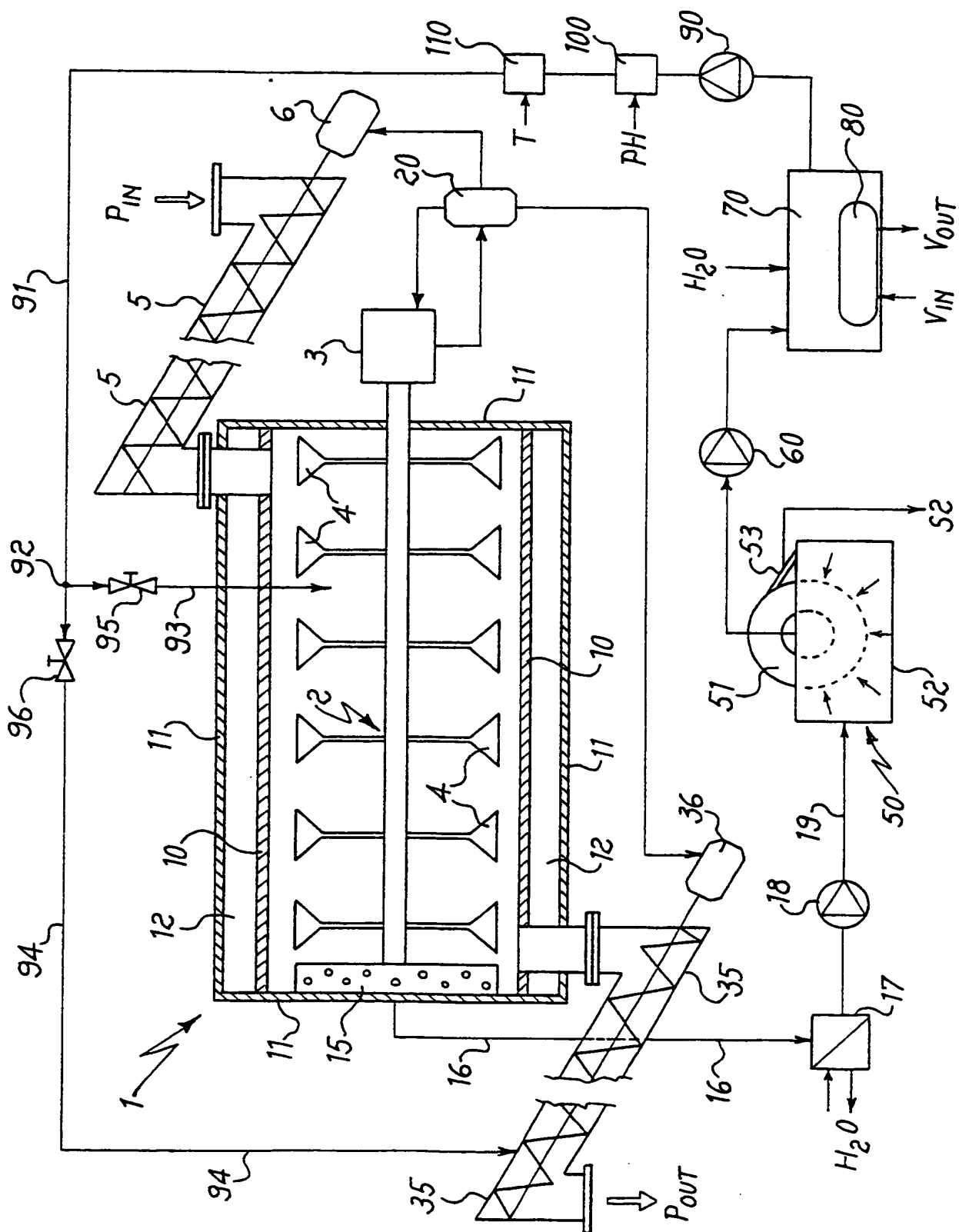
15. A method according to Claim 14, characterised in that the time said scales remain in said apparatus is regulated by acting on the quantity of scales fed to said washing apparatus and on the quantity of scales withdrawn from said washing apparatus.

16. A method according to Claim 14, characterised by further providing the regulation of the speed of rotation of said stirrer as a
20 function of the quantity of scales contained at that same moment in said apparatus.

17. A method according to Claim 14, characterised in that said washing apparatus comprises a substantially closed container in which said washing fluid and said scales are maintained at a
25 substantially constant temperature by means of a heating fluid that circulates in contact with the external surface of said container.

18. A method according to Claim 14, characterised by providing for the purification of said washing fluid by means of a filtering unit comprising at least one fine-pore filtering element.
19. A method according to Claim 14, characterised by providing
5 for the control of the temperature of said washing fluid leaving said filtering unit before its readmission into said washing apparatus.
20. A method according to Claim 14, characterised by providing for the control of the pH of said washing fluid and the addition of chemical mixtures to said washing fluid leaving said filtering unit
10 before its readmission into said washing apparatus.
21. A method according to Claim 14, characterised in that at least one fraction of said washing fluid is readmitted in counter-current with respect to the flow of said scales in a device for withdrawing said scales from said apparatus.
- 15 22. A method according to Claim 14, characterised by maintaining a quantity of said washing fluid in said apparatus that is proportional to the quantity of scales present at that same moment in said washing apparatus.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 99/00173

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B08B3/04 B08B3/08 B08B3/10 D06F37/30 D06F39/00
B29B17/02 B03B5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B08B D06F B29B B03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	EP 0 056 437 A (SIEMENS AG) 28 July 1982 (1982-07-28) page 1, paragraph 2 ---	1-22
A	PATENT ABSTRACTS OF JAPAN vol. 006, no. 267 (M-182), 25 December 1982 (1982-12-25) & JP 57 159612 A (YOSHINO KOGYOSHOKK), 1 October 1982 (1982-10-01) abstract --- -/--	1-22

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 99/00173

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

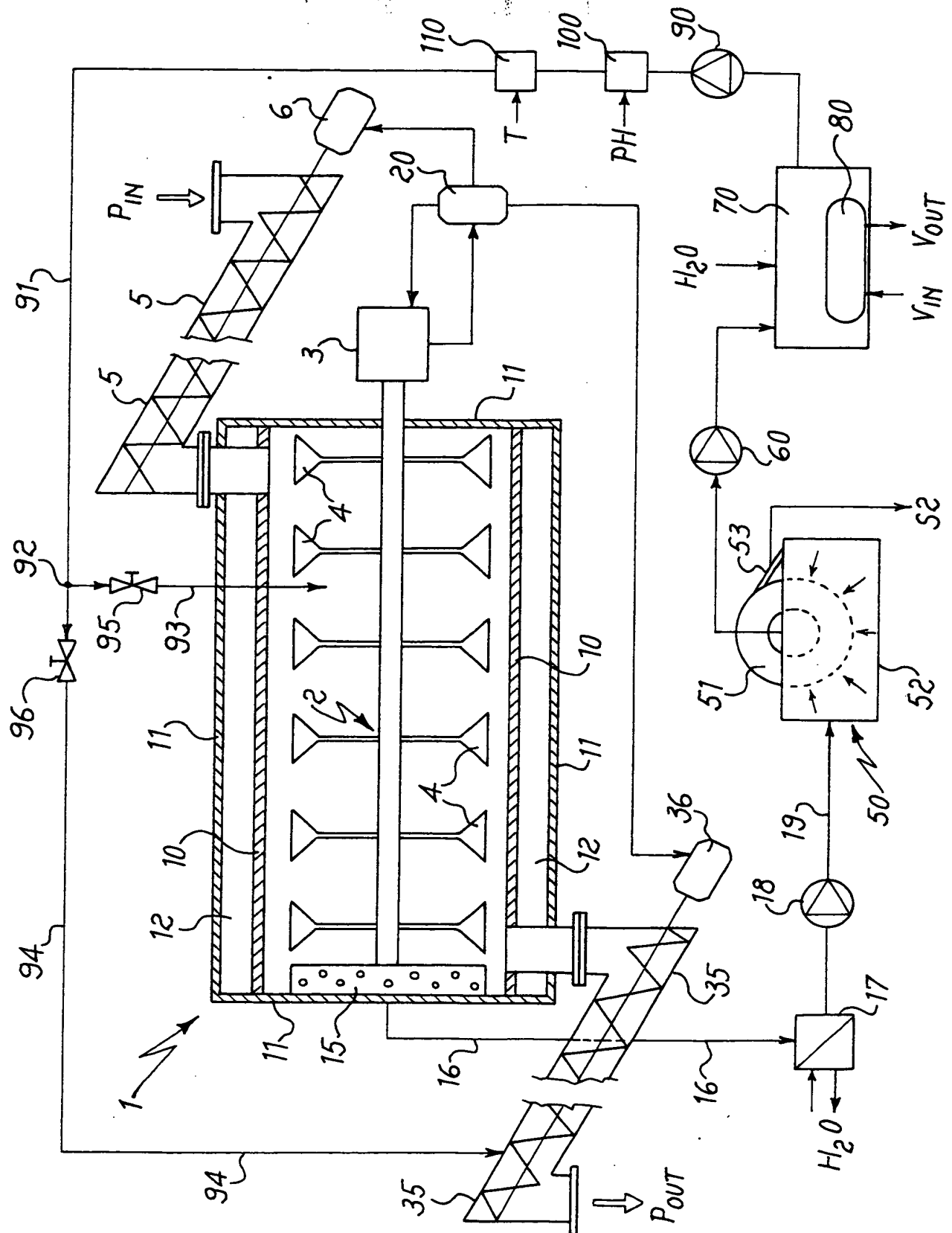
International Application No

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"IMPIANTO PER IL LAVAGGIO DI MATERIALE PLASTICO"

Campo dell'invenzione

La presente invenzione riguarda un impianto per il lavaggio di materiale plastico in scaglie, in particolare un impianto del tipo
5 destinato ad essere inserito in una linea per il trattamento delle materie plastiche riciclabili.

Stato della tecnica

I prodotti in materiale plastico contenenti una o più parti riciclabili vengono conferiti agli impianti di riciclaggio e sottoposti a diversi
10 trattamenti per separare le parti riciclabili e renderle idonee al successivo riutilizzo.

Un particolare esempio di materiale plastico riciclabile è il polietilene tereftalato (PET) con il quale vengono generalmente realizzate le bottiglie contenenti acque minerali, bibite o simili.

15 Per ottenere PET effettivamente riciclabile dalle bottiglie devono essere eliminate tutte quelle parti associate alle bottiglie ma realizzate con altri materiali, ad esempio le etichette cartacee o in plastica, la colla impiegata per fissarle alle stesse, nonché tappi e fondelli delle bottiglie generalmente realizzati in poliolefine o simili.

20 I procedimenti finora proposti nella tecnica nota, comprendenti diverse fasi di lavaggio e di separazione dei materiali, non hanno finora dato risultati soddisfacenti per quanto riguarda la purezza del materiale riciclabile ottenuto in uscita, né per i costi necessari ad ottenere un prodotto di purezza elevata. Questi inconvenienti sono
25 principalmente dovuti alla necessità di conciliare due esigenze nettamente contrastanti tra loro.

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Da un lato, il trattamento di lavaggio deve essere sufficientemente energico e protratto nel tempo da consentire il distacco della colla di fissaggio delle etichette. Inoltre, deve essere garantita la continua rimozione della colla e dei residui di etichette dal fluido di lavaggio.

- Dall'altro, i costi necessari per soddisfare questi requisiti sono particolarmente elevati, sia per quanto riguarda la notevole quantità del fluido di lavaggio necessario a rimuovere la colla, sia per quanto riguarda il lungo tempo di trattamento richiesto.
- 10 Bisogna inoltre tenere presente che è necessario portare la colla alla temperatura di fusione per consentire alla stessa di sciogliersi e di mescolarsi al fluido di lavaggio. Ciò richiede un elevato dispendio di energia, e quindi costi particolarmente elevati, se si desidera ottenere del PET riciclabile di purezza elevata.

15 Scopi dell'invenzione

Scopo della presente è quindi quello di proporre un impianto per il lavaggio in modo continuo di materiale plastico riciclabile che consenta di effettuare il lavaggio di materiale plastico, preferibilmente ridotto in scaglie, in modo particolarmente efficiente.

20 Un altro scopo della presente invenzione è quello di proporre un impianto del tipo sopra specificato, che consenta di effettuare il lavaggio di materiale plastico riciclabile a costi particolarmente contenuti.

25 Ulteriore scopo della presente invenzione è quello di proporre un metodo per effettuare il lavaggio in modo continuo di materiale

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plastico riciclabile che consenta di ottenere in uscita del materiale plastico riciclabile di elevata purezza.

Riassunto dell'invenzione

- Questi scopi sono raggiunti dalla presente invenzione, che riguarda
- 5 un impianto per il lavaggio in continuo di materiale plastico in scaglie, del tipo comprendente un'apparecchiatura di lavaggio dotata di almeno un agitatore rotante e contenente un fluido di lavaggio, almeno un'unità di filtrazione collegata all'apparecchiatura per depurare il fluido di lavaggio, un dispositivo
- 10 per alimentare le scaglie all'apparecchiatura di lavaggio, un dispositivo per prelevare le scaglie dall'apparecchiatura di lavaggio ed una pluralità di condotti per collegare in comunicazione di fluido l'apparecchiatura di lavaggio e l'unità di filtrazione ad un circuito in cui scorre il fluido di lavaggio,
- 15 caratterizzato dal fatto di comprendere mezzi per variare il tempo di permanenza delle scaglie nell'apparecchiatura di lavaggio in funzione della quantità di scaglie contenuta istantaneamente nell'apparecchiatura.
- In questo modo è possibile trattenere le scaglie
- 20 nell'apparecchiatura di lavaggio solo per il tempo necessario a rimuovere tutta la colla dalle scaglie, consentendo così una notevole limitazione del fluido di lavaggio impiegato durante il trattamento. Il fluido di lavaggio è ad esempio costituito da una soluzione acquosa mantenuta ad una temperatura sufficiente per
- 25 sciogliere la colla presente sulle scaglie.
- I mezzi per variare il tempo di permanenza delle scaglie

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- nell'apparecchiatura di lavaggio comprendono almeno un primo dispositivo di controllo che riceve in ingresso un dato rappresentativo della corrente assorbita dal motore di azionamento dell'agitatore e a comandare l'azionamento dei
- 5 motori associati rispettivamente al dispositivo per alimentare le scaglie e al dispositivo per prelevare le scaglie. I dispositivi per alimentare e prelevare le scaglie possono essere ad esempio costituiti da coclee inclinate azionate da rispettivi motori elettrici.
- Un secondo dispositivo di controllo consente di variare la velocità di
- 10 rotazione dell'agitatore in funzione della quantità di scaglie presenti istantaneamente nell'apparecchiatura. Ciò consente vantaggiosamente di adattare l'azione di frizionamento tra le scaglie impartita dall'agitatore in funzione della loro quantità presente in un certo istante nell'apparecchiatura.
- 15 Secondo un aspetto preferenziale della presente invenzione, l'apparecchiatura di lavaggio è costituita da un recipiente chiuso che è circondato da un involucro di rivestimento termoisolante per formare un'intercapedine tra la parete interna dell'involucro e la parete esterna del recipiente.
- 20 Nell'intercapedine viene vantaggiosamente immesso un fluido riscaldante, ad esempio vapore acqueo ad elevata temperatura, per mantenere all'interno dell'apparecchiatura una temperatura costante sufficiente a provocare lo scioglimento della colla dalle scaglie sottoposte a trattamento ed evitare che la colla stessa
- 25 solidifichi depositandosi nuovamente sulle scaglie.
- Il fluido di lavaggio prelevato dall'apparecchiatura viene condotto

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ad un'unità di filtrazione nella quale, oltre ai residui cartacei ancora presenti, viene separata la colla facendola depositare su un elemento filtrante a porosità fine. Quest'ultimo è preferibilmente costituito da un filtro a farina fossile dal quale viene continuamente
5 asportato lo strato di colla che vi aderisce.

Il fluido di lavaggio così depurato viene reintrodotta mediante un condotto di reimmissione che porta almeno una frazione del fluido di lavaggio depurato al dispositivo per prelevare le scaglie dall'apparecchiatura di lavaggio. Il fluido depurato in uscita
10 dall'unità di filtrazione, che risulta sicuramente più pulito rispetto al fluido di lavaggio trascinato assieme alle scaglie in uscita dall'apparecchiatura di lavaggio, viene vantaggiosamente utilizzato per effettuare un risciacquo delle scaglie prima che queste passino al successivo stadio. Ciò consente quindi di riportare
15 nell'apparecchiatura le eventuali impurità ancora presenti sulle scaglie. Viene così realizzato non solo un notevole risparmio del fluido di lavaggio impiegato, ma viene anche migliorata la purezza del materiale in uscita dall'apparecchiatura.

Lungo il condotto di reimmissione è preferibilmente previsto una
20 scambiatore di calore che consente di riportare il fluido alla temperatura desiderata prima della sua reintroduzione nell'apparecchiatura di lavaggio, così come una o più stazioni per controllare, ed eventualmente correggere il PH e la composizione del fluido reintrodotta.

25 L'invenzione riguarda ulteriormente un metodo per effettuare il lavaggio di materiale plastico in scaglie, del tipo che prevede

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l'alimentazione ed il prelievo in modo continuo di scaglie in una apparecchiatura di lavaggio dotata di almeno un agitatore rotante e contenente un fluido di lavaggio, caratterizzato dal fatto di prevedere la regolazione del tempo di permanenza delle
5 scaglie nell'apparecchiatura in funzione della quantità di scaglie contenuta istantaneamente nell'apparecchiatura stessa.

Un aspetto particolarmente vantaggioso del metodo secondo l'invenzione consiste nel mantenere nell'apparecchiatura di lavaggio una quantità di fluido di lavaggio che è proporzionale
10 alla quantità di scaglie presenti istantaneamente nell'apparecchiatura. Ciò consente di utilizzare solo la quantità di fluido effettivamente necessaria in ogni istante della fase di lavaggio consentendo così di limitare ulteriormente il consumo del fluido di lavaggio impiegato.

15 Il metodo secondo l'invenzione prevede inoltre la regolazione della velocità di rotazione dell'agitatore in funzione della quantità di scaglie contenuta istantaneamente in detta apparecchiatura, consentendo così di variare l'azione di frizionamento sulle scaglie in funzione dell'effettiva quantità di scaglie sottoposta a lavaggio in
20 un determinato istante.

Breve descrizione dei disegni

Ulteriori vantaggi e caratteristiche della presente invenzione saranno più evidenti dalla descrizione che segue, fatta a titolo illustrativo e non limitativo, con particolare riferimento alla figura
25 allegata, nella quale è illustrata una vista schematica dell'impianto secondo la presente invenzione.

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Descrizione delle realizzazioni preferenziali

- In figura è rappresentato un impianto per il lavaggio in continuo di materiale plastico in scaglie e, in particolare, di scaglie in PET riciclabile. L'impianto comprende in particolare
- 5 un'apparecchiatura di lavaggio 1 dotata di un agitatore 2, posto in rotazione da un motore elettrico 3, con una pluralità di pale 4 che impartiscono un'azione di agitazione ad un fluido di lavaggio, costituito preferibilmente da una soluzione acquosa, ed alle scaglie di materiale plastico presenti nell'apparecchiatura 1.
- 10 Il materiale plastico in scaglie che giunge all'apparecchiatura 1, rappresentato simbolicamente dalla freccia P_{IN} , viene introdotto nell'apparecchiatura di lavaggio 1 mediante una coclea inclinata 5 mossa da un motore elettrico 6. Le scaglie introdotte nell'apparecchiatura 1 trasportano generalmente anche una
- 15 piccola frazione di un fluido, costituito anch'esso da una soluzione acquosa, utilizzato nelle stazioni di lavorazione poste a monte, ad esempio una vasca di separazione per flottazione tra PET (più pesante dell'acqua) e poliolefine o simili (più leggere dell'acqua). All'interno dell'apparecchiatura di lavaggio 1 le scaglie sono
- 20 sottoposte all'azione di agitazione impartita dall'agitatore 2 in presenza del fluido di lavaggio mantenuto ad una temperatura costante prestabilita compresa nell'intervallo tra 85 °C e 100 °C, preferibilmente intorno a circa 95 °C. L'agitatore provoca un'energica azione di frizionamento reciproco tra le scaglie e la
- 25 contemporanea azione del fluido di lavaggio in temperatura provoca il distacco della colla dalle scaglie ed il suo trasferimento

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in sospensione nel fluido di lavaggio.

Per evitare che la colla solidifichi nuovamente e si ridepositi sulle scaglie stesse, è particolarmente importante mantenere costante la temperatura all'interno dell'apparecchiatura. Per questo motivo,

5 l'apparecchiatura di lavaggio 1 è realizzata con un recipiente chiuso 10 completamente circondato da un involucro di rivestimento termoisolante 11. Tra la parete esterna del recipiente 10 e la parete interna dell'involucro di rivestimento 11 è ricavata un'intercapedine 12 nella quale viene fatto circolare del vapore a
10 temperatura elevata per consentire di mantenere sostanzialmente costante all'interno dell'apparecchiatura di lavaggio 1.

Il flusso di scaglie all'interno dell'apparecchiatura di lavaggio 1, e quindi il loro tempo di permanenza nell'apparecchiatura, viene controllato in base alla quantità di scaglie presenti
15 istantaneamente nell'apparecchiatura di lavaggio. Ciò viene realizzato rilevando la corrente istantanea assorbita dal motore 3 di azionamento dell'agitatore 2. Il segnale rappresentativo di questo parametro viene inviato ad un'unità di controllo 20 che comanda conseguentemente il motore 6 della coclea 5 di introduzione delle
20 scaglie ed il motore 36 della coclea 35 di prelievo delle scaglie. Ad entrambi i motori elettrici 6 e 36 sono associati rispettivi dispositivi del tipo "inverter" che consentono di regolare la velocità delle coclee.

Un ulteriore controllo viene effettuato sulla velocità di rotazione del motore 3, e quindi sull'azione di agitazione all'interno
25 dell'apparecchiatura di lavaggio 1, sempre in funzione delle scaglie presenti istantaneamente nell'apparecchiatura 1. Questo

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controllo può essere effettuato dalla stessa unità 20, come rappresentato in figura, oppure eventualmente da un'unità di controllo separata, che agiscono su un dispositivo del tipo "inverter" associato al motore elettrico 3.

- 5 Questi controlli consentono vantaggiosamente di adattare i parametri che determinano un efficace lavaggio delle scaglie, vale a dire il tempo di permanenza e l'entità dell'agitazione, tenendo conto della quantità di scaglie presenti in un determinato istante nell'apparecchiatura. Per il lavaggio effettuato in continuo
10 ciò consente di mantenere costante la qualità del prodotto in uscita dall'impianto secondo la presente invenzione.

E' opportuno sottolineare che il fluido di lavaggio presente nell'apparecchiatura di lavaggio 1 viene sempre mantenuto, durante il funzionamento a regime, in quantità sostanzialmente
15 proporzionale alla quantità di scaglie presenti istantaneamente nell'apparecchiatura. Ciò viene ottenuto regolando la quantità di fluido di lavaggio che viene reimpressa nell'apparecchiatura in funzione della quantità di fluido espulsa dall'unità di filtrazione 50 che verrà descritta più in dettaglio nel seguito.

- 20 Le scaglie uscenti dall'apparecchiatura (indicate schematicamente dalla freccia P_{OUT}) vengono prelevate dalla coclea 35 all'estremità opposta rispetto a quella di introduzione ed indirizzate allo stadio successivo di lavorazione, ad esempio uno stadio di risciacquo e/o di asciugatura e/o di essiccazione delle
25 scaglie. In corrispondenza dell'estremità di prelievo è prevista una griglia forata 15 che consente il prelievo del fluido di lavaggio da

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depurare ed indirizzarlo ad una particolare unità di filtrazione 50 che consente la rimozione della colla dal fluido di lavaggio.

Il fluido di lavaggio uscente dall'apparecchiatura 1 viene indirizzato mediante un condotto 16 ad uno scambiatore di calore 17 che
5 provvede ad abbassare la temperatura del fluido mediante circolazione di acqua fresca. Una pompa 18 posta lungo un condotto 19 consente di trasferire il fluido di lavaggio dallo scambiatore di calore 17 all'unità di filtrazione 50. Quest'ultima comprende un elemento filtrante 51, del tipo a porosità fine,
10 parzialmente immerso in una vasca 52. L'elemento filtrante 51 è costituito preferibilmente da un tamburo realizzato con farina fossile sul quale viene continuamente depositata, e dal quale viene continuamente rimossa, la colla miscelata al fluido di lavaggio.

Poiché la temperatura del fluido nell'unità di filtrazione 50 risulta
15 inferiore alla temperatura di fusione della colla, quest'ultima si deposita sulla superficie esterna dell'elemento filtrante 51 e viene continuamente asportata, eventualmente assieme ad un sottilissimo strato dell'elemento filtrante 51, da una spatola 53 ed espulsa attraverso uno scarico S2.

20 Il fluido di lavaggio così depurato viene rigenerato nelle sue caratteristiche essenziali prima di essere reintrodotta nuovamente nell'apparecchiatura di lavaggio 1. In particolare, il fluido viene prelevato dall'unità di filtrazione 50 mediante una pompa 60 ed indirizzato verso un serbatoio di accumulo 70, in cui uno
25 scambiatore di calore 80 ne innalza la temperatura mediante vapore (frecche V_{IN} e V_{OUT}). Per compensare le perdite di fluido

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nell'unità di filtrazione 50 e per il rinnovo del circuito viene introdotta dell'acqua fresca (freccia H₂O) nel serbatoio di accumulo 70.

Il fluido spinto da una pompa 90 viene condizionato in una stazione di controllo 100 con una eventuale correzione del PH mediante
5 immissione di opportuni additivi (freccia PH), nonché in una stazione 110 in corrispondenza della quale vengono aggiunti opportuni additivi chimici (freccia T) quali ad esempio sostanze tensioattive o simili.

Un condotto 91 porta quindi il fluido verso una diramazione 92 dalla
10 quale parte un condotto 93 che riporta il fluido depurato direttamente nell'apparecchiatura di lavaggio 1. Parte del fluido depurato viene vantaggiosamente convogliato in un altro condotto 94, anch'esso collegato alla diramazione 92, ed introdotta nella coclea 35 per effettuare un efficace risciacquo
15 delle scaglie in controcorrente. Entrambi i condotti 93 e 94 sono preferibilmente dotati di rispettive valvole 95 e 96 per consentire la regolazione indipendente delle frazioni di liquido reintrodotta nell'apparecchiatura 1 e nella coclea 35.

Preferibilmente, la quantità di fluido di lavaggio immessa
20 inizialmente nell'apparecchiatura è proporzionale a quella che si presume essere la quantità ideale per ottenere un lavaggio efficace. Si è potuto constatare che, durante il funzionamento a regime, la quantità di fluido di lavaggio presente istantaneamente nell'apparecchiatura 1 tende comunque a restare sostanzialmente
25 proporzionale rispetto alla quantità di scaglie presenti nello stesso istante all'interno dell'apparecchiatura di lavaggio 1. Ciò è dovuto

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al fatto che le scaglie, tanto in ingresso quanto in uscita, trascinano in ogni caso del fluido che aderisce ad esse.

Pertanto, l'unica regolazione necessaria per mantenere la desiderata proporzione ottimale tra quantità di scaglie e quantità
5 del fluido di lavaggio può essere effettuata agendo semplicemente sull'immissione di acqua fresca in corrispondenza del serbatoio di accumulo 70 e sulla pompa 90. Ciò consente non solo di limitare la quantità di fluido utilizzato dall'impianto, ma anche di avere sempre le condizioni ideali all'interno
10 dell'apparecchiatura 1 per ottenere un efficace trattamento di lavaggio in continuo, indipendentemente dalla variazione dei flussi di scaglie a monte e/o a valle dell'impianto secondo la presente invenzione.

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RIVENDICAZIONI

1. Impianto per il lavaggio in continuo di materiale plastico in scaglie, del tipo comprendente un'apparecchiatura di lavaggio dotata di almeno un agitatore rotante e contenente un fluido di lavaggio, almeno un'unità di filtrazione collegata a detta apparecchiatura per depurare detto fluido di lavaggio, un dispositivo per alimentare dette scaglie a detta apparecchiatura di lavaggio, un dispositivo per prelevare dette scaglie da detta apparecchiatura di lavaggio ed una pluralità di condotti per collegare in comunicazione di fluido detta apparecchiatura di lavaggio e detta unità di filtrazione ad un circuito in cui scorre detto fluido di lavaggio, caratterizzato dal fatto di comprendere mezzi per variare il tempo di permanenza di dette scaglie in detta apparecchiatura di lavaggio in funzione della quantità di scaglie contenuta istantaneamente in detta apparecchiatura.
2. Impianto secondo la rivendicazione 1, caratterizzato dal fatto che detto agitatore rotante, detto dispositivo per alimentare dette scaglie e detto dispositivo per prelevare dette scaglie sono azionati da rispettivi motori elettrici.
3. Impianto secondo la rivendicazione 1 o 2, caratterizzato dal fatto che detti mezzi per variare il tempo di permanenza di dette scaglie in detta apparecchiatura di lavaggio comprendono almeno un primo dispositivo di controllo atto a ricevere in ingresso un dato rappresentativo della corrente assorbita dal motore di azionamento di detto agitatore e a comandare l'azionamento di detti motori associati rispettivamente a detto dispositivo per

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alimentare dette scaglie e a detto dispositivo per prelevare dette scaglie.

4. Impianto secondo la rivendicazione 1, caratterizzato dal fatto di comprendere almeno un secondo dispositivo di controllo per
5 variare la velocità di rotazione di detto agitatore in funzione della quantità di scaglie contenuta in detta apparecchiatura di lavaggio.
5. Impianto secondo una qualsiasi delle rivendicazioni precedenti, caratterizzato dal fatto che detta apparecchiatura di
10 lavaggio è costituita da un recipiente chiuso e circondato da un involucro di rivestimento termoisolante per formare un'intercapedine tra la parete interna di detto involucro e la parete esterna di detto recipiente.
6. Impianto secondo la rivendicazione 5, caratterizzato dal fatto
15 di comprendere mezzi per far circolare un fluido riscaldante in detta intercapedine.
7. Impianto secondo una qualsiasi delle rivendicazioni precedenti, caratterizzato dal fatto che detto fluido di lavaggio è costituito da una soluzione acquosa.
- 20 8. Impianto secondo una qualsiasi delle rivendicazioni precedenti, caratterizzato dal fatto di comprendere un condotto di reimmissione che porta almeno una frazione del fluido di lavaggio depurato da detta almeno una unità di filtrazione a detto
25 dispositivo per prelevare dette scaglie da detta apparecchiatura di lavaggio, la restante frazione di detto fluido essendo reintrodotta direttamente in detta apparecchiatura di lavaggio.

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9. Impianto secondo la rivendicazione 8, caratterizzato dal fatto di comprendere almeno un dispositivo di scambio termico posto lungo detto condotto di reimmissione per controllare la temperatura di detto fluido di lavaggio mediante un fluido riscaldante.
10. Impianto secondo la rivendicazione 8, caratterizzato dal fatto di comprendere almeno un dispositivo posto lungo detto condotto di reimmissione per il controllo del PH di detto fluido di lavaggio.
11. Impianto secondo la rivendicazione 8, caratterizzato dal fatto di comprendere almeno una stazione posta lungo detto condotto di reimmissione per aggiungere uno o più prodotti chimici alla soluzione acquosa che costituisce detto fluido di lavaggio.
12. Impianto secondo la rivendicazione 6 o 9, caratterizzato dal fatto che detto fluido riscaldante immesso in detta intercapedine ed in detto dispositivo di scambio termico è costituito da vapore acqueo ad elevata temperatura.
13. Impianto secondo una qualsiasi delle rivendicazioni precedenti, caratterizzato dal fatto che detta almeno una unità di filtrazione comprende almeno un elemento filtrante a porosità fine.
14. Metodo per effettuare il lavaggio di materiale plastico in scaglie, del tipo che prevede l'alimentazione ed il prelievo in modo continuo di dette scaglie ad una apparecchiatura di lavaggio dotata di almeno un agitatore rotante e contenente un fluido di lavaggio, caratterizzato dal fatto di prevedere la regolazione del tempo di permanenza di dette scaglie in detta apparecchiatura in funzione della quantità di scaglie contenuta istantaneamente in

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detta apparecchiatura.

15. Metodo secondo la rivendicazione 14, caratterizzato dal fatto che il tempo di permanenza di dette scaglie viene regolato agendo sulla quantità di scaglie alimentate a detta
5 apparecchiatura di lavaggio e sulla quantità di scaglie prelevate da detta apparecchiatura di lavaggio.
16. Metodo secondo la rivendicazione 14, caratterizzato dal fatto di prevedere ulteriormente la regolazione della velocità di rotazione di detto agitatore in funzione della quantità di scaglie
10 contenuta istantaneamente in detta apparecchiatura.
17. Metodo secondo la rivendicazione 14, caratterizzato dal fatto che detta apparecchiatura di lavaggio comprende un recipiente sostanzialmente chiuso in cui detto fluido di lavaggio e dette
15 scaglie sono mantenuti a temperatura sostanzialmente costante mediante un fluido riscaldante che circola a contatto della superficie esterna di detto recipiente.
18. Metodo secondo la rivendicazione 14, caratterizzato dal fatto di prevedere la depurazione di detto fluido di lavaggio mediante un'unità di filtrazione comprendente almeno un elemento filtrante
20 a porosità fine.
19. Metodo secondo la rivendicazione 14, caratterizzato dal fatto di prevedere il controllo della temperatura di detto fluido di lavaggio uscente da detta unità di filtrazione prima della sua reimmissione in detta apparecchiatura di lavaggio.
- 25 20. Metodo secondo la rivendicazione 14, caratterizzato dal fatto di prevedere il controllo del PH di detto fluido di lavaggio e

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l'addizione di composti chimici a detto fluido di lavaggio uscente da detta unità di filtrazione prima della sua reimmissione in detta apparecchiatura di lavaggio.

21. Metodo secondo la rivendicazione 14, caratterizzato dal fatto
5 che almeno una frazione di detto fluido di lavaggio viene reimpresso in controcorrente rispetto al flusso di dette scaglie in un dispositivo per il prelievo di dette scaglie da detta apparecchiatura.

22. Metodo secondo la rivendicazioni 14, caratterizzato dal fatto
10 di mantenere in detta apparecchiatura di lavaggio una quantità di detto fluido di lavaggio che è proporzionale alla quantità di scaglie presenti istantaneamente in detta apparecchiatura.

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RIASSUNTO

Un impianto per il lavaggio in continuo di materiale plastico in scaglie, comprende un'apparecchiatura di lavaggio, almeno un'unità di filtrazione collegata all'apparecchiatura per depurare il
5 fluido di lavaggio e mezzi per variare il tempo di permanenza delle scaglie nell'apparecchiatura di lavaggio in funzione della quantità di scaglie contenuta istantaneamente nell'apparecchiatura stessa.

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